North Umpqua Hydropower Mitigation Strategic Plan
Impacts List

Step 1. Statement of Problems to be Addressed (These impacts are not listed in any particular order of importance):

1. **Wetlands and Stillwater Habitat**
   a. Fundamental objective: Maintain functioning wetland habitat proportional in size, distribution and function comparable to what had existed prior to the hydroelectric project.
   b. Means objective: restore, enhance or create wetlands that are self-sustainable with native plant and animal species diversity and composition characteristic of the native ecosystem.
   c. Existing situation: Approximately 26 acres of wetlands were permanently inundated under the Lemolo, Toketee and Stump Lake reservoirs. The Settlement Agreement identified eight wetlands for enhancement or creation. No acreage targets were established. Four have been completed to date totaling about two acres. Another 2.9 acres of wetland have been created with mitigation funds to date.

Lost to Impoundments		
Lemolo Lake	17.0	ac.
Stump Lake	5.0	
Toketee Lake	4.0	
Subtotal	26.0	
Compensation to Date		
Settlement Agree.	2.0	ac.
Mit. Fund	2.9	
Subtotal	4.9	
Difference	**21.1**	ac.

2. **Aquatic Invasive Species (SA § 9.6, 1 mit fund project)**
   a. Fundamental Objective: Identify and treat Aquatic Invasive Species (AIS) for the benefit of native anadromous and resident fish and wildlife populations.
   b. Means Objective: Identify and control/remove AIS on public lands in proximity to the Project and in accordance with the ODFW MOU, as referenced in SA subsection 9.6. Projects that have the objective of completely removing (not just controlling) AIS subpopulations may receive priority.
   c. Existing Situation: The listed SA subsections are being conducted with ongoing implementation as required. Increased emphasis on complete AIS subpopulation removal is necessary. Ongoing implementation and/or effectiveness monitoring is warranted to further support prioritization of complete AIS removal.

3. **Vegetation Management – Invasive Species**
    a. Fundamental Objective: Maintain native plant community diversity and structure commensurate with the historic range of variability.
    b. Means Objective: to prevent new infestations of invasive species from establishing and prioritize current invasive species for management.
    c. Existing Situation: Approximately 227 acres of transmission line corridors, project facilities and roads facilitate establishment and movement of invasive weeds and other non-native plants. There were 639 infestations of 14 species totaling 111.4 acres in 2003 which has grown to 794 infestations of 15 species totaling 146.7 acres in 2012. The Vegetation Management Plan sect. 4.0 (SA sec 2.1 & 12.2, pg. 34) requires PacifiCorp to inventory and manage priority weed infestations within the project area. Some of this increase is the result of better mapping.

4. **Aquatic Connectivity** (SA § 7.1, 7.2, 7.3, 7.4, 7.5, 8.2, 8.3, 10.4, 10.6, 10.7, NUCWA)
    a. Fundamental Objective: Maintain transport and routing of organic material (sediment, wood, etc.) comparable in extent and distribution to what had existed prior to the hydroelectric project.
    b. Means Objective: Restore, enhance, and maintain transport and routing of organic material in all waterways that historically allowed for such connectivity.
    c. Existing Situation: SA Section 7 (Restoration of Fluvial Geomorphic Processes) and SA Section 8 (Main-Stem North Umpqua Anadromous Fish Spawning Habitat Enhancement) have largely been implemented, though rates and timing of organic material transport and routing continue to be unnaturally impacted by the hydropower infrastructure, primarily Soda Springs and Slide Creek Dams. Additional treatments and monitoring in response to prior efforts is necessary to satisfy associated objectives. The remaining listed SA subsections are nearing completion, and subsequent implementation and/or effectiveness monitoring is warranted.

5. **Terrestrial Species Connectivity and Wildlife Entrapment**
    a. Fundamental objective: Maintain terrestrial habitat connectivity so that movement, dispersal, migration, and interbreeding among subpopulations of all terrestrial wildlife species can occur. Create a waterway system that has insignificant effects on populations of wildlife species in the Project vicinity and that minimizes wildlife entrapment-related injury and mortality of individuals.
    b. Means objective: Modify, enhance or compensate for the network of roads, canals, penstock, transmission lines and other project features necessary to facilitate wildlife movement and reduce mortality as much as possible. Upgrade or provide new culverts that provide passage under roads or other project features for aquatic organisms, including amphibians and reptiles.
    c. Existing Situation: Thirty four, 36 foot wide wildlife bridges have been constructed at identified areas across the 21.7 miles of canal. The nine identified

crossings have been excavated under the 5.8 miles of penstock. The last four of the approximately 92 identified aquatic reconnections are planned for completion in 2013. A "wiggle ramp" was installed at the dam at Stump Lake and culverts and curbs are planned to provide passage for turtles at Stinkhole. Informal monitoring of wildlife bridges indicates that all of the bridges are receiving use by big game as intended. Continue to monitor bridges and aquatic reconnections to determine adequacy and make improvements where appropriate.

Canal	21.7	mi.	JS
wildlife bridges	34	count (36 ' wide)	SA
Penstock	5.8	mi.	JS
Crossings excavated	9	count	SA
Roads	200	mi.	JS (322 actual mi associated with project - about 1/2 are joint use)
	8.6	mi.	decommissioned SA

Transmission Line	117.8	mi.	Total from JS
on FS	66.7		
on BLM	6.2		
on pvt	7.5		
actual total	80.4		Sum not double counting adjacent lines
LSR under T-Line	22	mi.	266.7 ac
RR under T- Line	18		218.2
Avg. Clearing Width	100	ft.	

6. **Fisheries** (SA § 9.1, 9.2, 9.5)
    a. Fundamental Objective: Maintain or improve recreational fisheries in the Project reservoirs and forebays while minimizing impacts to native aquatic species and habitat.
    b. Means Objective: Restore, enhance, and maintain recreational fisheries in the Project reservoirs and forebays while minimizing impacts to native aquatic species and habitat.
    c. Existing Situation: The listed SA subsections are being conducted with ongoing implementation as required. Ongoing implementation and/or effectiveness monitoring is warranted.

7. **Impacts to Aquatic Habitat Ecology** (SA § 3.6, 4.1.1(f), 4.3.3, 6.2, 10.5, 10.6, 14.2, 19.2, floodplain function, hatchery strays, 5 mit fund projects)

a. Fundamental Objective: Maintain aquatic habitat conditions that are able to sustain aquatic- and riparian-dependent organisms within the footprint of the hydropower project.
b. Means Objectives: Restore, enhance, and maintain aquatic habitat conditions within the footprint of the hydropower project. Utilize restoration techniques that encompass a holistic approach to aquatic ecology and water quality.
c. Existing Situation:
    i. Construction of Soda Springs Generator and Slide Creek Generator Tailrace Barriers has been completed. Both barriers have been constructed with Soda balanced and operating, however Slide Creek TRB needs to be hydraulically balanced.
    ii. Toketee Reservoir trash rack was modified to "isolate" brown trout. Appropriately sized intake grate was installed to exclude brown trout >5" to decrease the numbers of brown trout downstream of Toketee Reservoir that may prey on anadromous fish juveniles.
    iii. A monitoring plan was developed and assessment will occur when anadromous fish populate the reach between Soda Springs Dam, Slide Creek Dam, and tributaries.
    iv. Riparian habitat along project affected reaches of White Mule and Potter Creeks has been modified and planted with native species.
    v. Priority 1 and 2 tributaries as listed in Schedule 10.6 of the Settlement Agreement have been reconnected to their historic channels.
    vi. Creation of canal shut-off and drainage systems on the Clearwater 2, Lemolo 2, and Fish Creek canals to prevent excessive erosion due to canal breakage or overtopping.
    vii. A Long-Term Monitoring and Predation Plan has been completed. Monitoring/data collection will continue for numerous parameters for the life of the license. . Potentially most impactful are predation of juvenile anadromous fish by brown trout in Soda Springs Reservoir. The extent of the potential impact was modeled but remains invalidated.
    viii. No provision or requirement for removal/sorting of stray hatchery fish at Soda Dam fish ladder.
    ix. Spawning gravel augmentation in Upper North Umpqua River below Slide Creek Dam. Implementation occurred in 2008, 2009, 2011. A total of 3569 cu yds of gravel was added to the North Umpqua River.
    x. Instream wood placement project in lower 0.75 miles of Buster and Johnson Creeks. The project added 40-80 pieces per mile.
    xi. Four mainstem side channels in Rock Creek had log placement and tree lining activities to enhance physical habitat components. Approximately 200 trees were added over one mile of stream in 2011.
    xii. Reconstruct historic fish habitat enhancement log weir in Copeland Creek to offset degradation of the structure while maintaining existing gravel accumulations.
    xiii. Instream wood restoration in Copeland Creek consisting of 150 pieces placed by tree lining, lining cut logs, and tree falling.

8. **Vegetation Management – Late-Successional/Old Growth Forest**
    a. Fundamental Objective: Maintain native plant community diversity and structure commensurate with the historic range of variability.
    b. Means Objective: Manage vegetation under power lines to provide early-seral native species composition and structure along with late-successional features such as logs consistent with guidelines for safe power line operations. Compensate for late-successional/old-growth forest permanently lost to project operations through planting and stand improvement of nearby stands in suitable land allocations.
    c. Existing Situation: Approximately 578 acres of pre-commercial thinning in LSR has been completed.

Total Project Area Occupied			
on FS	2725	ac	
on BLM	117		From FERC FEIS
on pvt (est.)	226		(subtracted from 3068 total project acres)
Total	3068		

9. **Aquatic Organism Passage** (SA § 1.1.4, 4.1, 4.1.2, 4.2, 4.3, 15.6, and 6 mit funded projects)

    a. Fundamental objective: Maintain upstream and downstream fish passage comparable in extent and distribution to what had existed prior to the hydroelectric project.

    b. Means objective: Restore, enhance, and maintain upstream and downstream connectivity for aquatic biota in all waterways that historically allowed for passage.

    c. Existing situation:
        i. Fish passage waiver to PacifiCorp from ODFW for selected areas and terms/agreements in MOU (Settlement Agreement Appendix E).
        ii. A fish ladder was constructed over Soda Springs Dam. The Soda Springs fish ladder and screens are semi-operational as of June 2013 due to damage sustained to the fish screens in December 2012. The Soda Springs fish ladder allows passage upstream however offers limited passage for downstream migration due to inoperable fish screens. Screens are scheduled to again become operational in October 2013. Hydraulic balancing and biological evaluation will occur in 2013-2014.
        iii. In lieu of a fish ladder at Slide Creek Dam, there is an agreement to provide "…mitigation measures and funding to benefit wild anadromous and other migratory fish populations on-site or in proximity to the project…" to offset the 1.8 miles of historic anadromous habitat that is no longer accessible.
        iv. "PacifiCorp shall provide benefits to fish and wildlife in the upper North Umpqua Basin in lieu of installing fish ladders at Toketee, Clearwater 1,

Clearwater 2, and Lemolo 1 Dams…". Lemolo 2 fish ladder modification completed. Fish Creek fish ladder functioning properly-no modification required. Fish Creek fish screens installed at Fish Creek Canal intake and balanced.

v. A culvert inventory has been conducted in other areas of the hydropower project and culverts prohibiting fish passage have been replaced. A fish passage culvert was installed under 3401 road. It was designed for improved fish passage and to allow for Q100 flow events. A fish passage culvert was installed in Deep Creek and allows access to an additional 3 miles of anadromous stream. A fish ladder modification was completed on the Steamboat Falls fish ladder. The project improved passage on 55 miles of mainstem Steamboat Creek and tributaries. An AOP culvert was installed on White Mule Creek under 2610 road that was designed for Q100 flow events. A fish passage culvert was installed on Johnson Creek that allows access to an additional 2 miles of anadromous stream.

10. **Vegetation Management** – Unique Habitats including oak, madrone Vegetation Management , dry meadows, cliffs and rocky openings
    a. Fundamental Objective: Maintain native plant community diversity and structure commensurate with the historic range of variability.
    b. Means Objective: Manage vegetation under power lines to provide open habitat with species composition and structure as close as possible to historic conditions consistent with clearing requirements for power lines. Compensate for oak, madrone and other unique habitats that have been lost are altered by project developments by restoring historic stand structure and composition in nearby stands.
    c. Existing Situation: There are approximately 159 acres of oak/madrone and dry meadow habitat that has been identified as being associated with project developments and another 261 acres of meadow openings under transmission lines. Currently 11 acres of chinquapin habitat have been restored. There are approximately 373 acres of potential oak restoration in the Medicine Creek area in the early planning stages.

11. **Avian Protection**
    a. Fundamental Objective: to minimize adverse interactions between Project power lines and birds.
    b. Means Objectives: follow established procedures for monitoring and managing bird mortalities and problem nests; retrofit or rebuild poles involved in bird fatalities; and construct new power poles in accordance with published "raptor-safe" guidelines.
    c. Existing Situation: 117.5 miles of power lines have potential to cause injury and mortality to birds. PacifiCorp provides an annual report that identifies incidental discoveries of bird fatalities. The only species of concern identified to date has been a sapsucker (MIS cavity nester) fatality that occurred in 2009. A formal monitoring protocol would determine the need, if any, for improving power pole standards.

12. **Vegetation Management – Fuels Management**
    a. Fundamental Objective: to reduce the risk of uncharacteristic fire impacts related to vegetation management along the transmission lines.
    b. Means Objective: to conduct fuels management activities, including prescribed fire, to restore or maintain fire resilient stands and fire dependent species.
    c. Existing Situation: The Fire Suppression and Vegetation Management Plans provide standards for hazard tree removal (Vegetation Management Plan 3.1.2) along powerline corridors as well as managing slash & debris (Vegetation Management Plan 3.1.6). Even with adherence to vegetation control guidelines there remains a slightly elevated risk of fire starts that can result when vegetation contacts ungrounded supply conductors. The 8395 acre Williams Fire appears to have resulted from an ignition along a transmission line. The mitigation fund has contributed to planning for fuels reduction with the Steamboat, Ragged Ridge and Lemon Buttes projects.

13. **Soil Loss and Soil Productivity resulting in Erosion** (SA § 14.1)
    a. Fundamental objective: maintain soil productivity to allow for ecosystem functioning both above and below ground. Soil productivity includes chemical, physical and biological functioning. Where soil productivity has been lost to a semi-permanent change in land management (e.g. road, canal or impoundment removing/burying soil) mitigate the loss of soil productivity through in-direct off-site restoration.
    b. Means objective: Modify, enhance or compensate for the network of roads, canals, penstocks, impoundments, facilities and other project features to maintain soil productivity and limit soil erosion.
    c. Existing Situation:
        i. 100 sites were identified where erosion and/or landslides has occurred (Justification Statements). 31 high priority, 27 medium priority (schedule 14.4)
            1. The Erosion Control Plan addressed all 31 high-priority sites and 10 of the medium-priority sites
            2. 17 medium-priority sites and 42 low-priority sites remain un-mitigated
            3. Erosion from cut and fill slopes on 200 miles of roads associated with hydropower operations and canals (Justification Statements) – larger sites were addressed in the Erosion Control Plan, but smaller, chronic surface erosion sites are not addressed elsewhere.
        ii. Improper sizing and placement of culverts results in failures
            1. The Erosion Control Plan addressed the need to upsize Hydropower related culverts
        iii. Loss of soil productivity on 760 acres where soil was buried (and severely compacted) or displaced during construction of canals (21.7 miles), penstocks (5.8 miles), flumes (9.8 miles), roads (36 miles – EIS states there are ~100 miles of PacifiCorp only roads), forebays and reservoirs

(618 acres), and other associated infrastructure (other associated infrastructure such as buildings and houses were not quantified - Justification Statements). Minor changes in soil productivity are also expected under the 117.5 miles of transmission line but are not included in the area quantification above.

14. **Water Quality** (SA § 1.1.6, 14.2, 14.4, WQ at Lemolo Lake, intro of fine sediment to streams)
    a. Fundamental objective: Maintain water quality parameters that are within Oregon DEQ standards and comparable to conditions that existed prior to the development of the hydropower project.
    b. Means objective: Ensure that water quality standards are not compromised during normal hydropower operations and related restoration and construction projects. Restore water quality parameters if operations contribute to degraded or compromised water quality conditions.
    c. Existing Situation:
        i. ODEQ 401 Water Quality Certification issuance.
        ii. Creation of canal shut-off and drainage systems on the Clearwater 2, Lemolo 2, and Fish Creek canals to prevent excessive erosion due to canal breakage or overtopping.
        iii. Remediation of 31 high priority and 27 medium priority erosion sites (see Schedule 14.4 of the Settlement Agreement) in close proximity to stream courses on LM 2 , CW 2, and Fish Creek. High priority sites have been completed.
        iv. Prolific algae blooms occurred annually from 2006 to present in a hydropower created environment. Potential causal (or contributing) factors include the following: invasive species (tui chub); non-native species present (brown trout and kokanee salmon); stocking of lake with rainbow trout; and PacifiCorp water handling changes since 2006. Potential ramifications include: public health risk, economic loss to businesses, reduced campground receipts, decreased recreational use (boating, fishing, swimming, etc.)
        v. Approximately 3,000 cyd. of sediment delivered to North Umpqua River channel and floodplain by a July 2011 landslide caused by a canal breach. A site remediation was conducted and a remediation plan (mitigation payment and stream monitoring plan) was created. Monitoring is to continue for several years.

15. **Instream Flows** (SA § 5.1, 5.5, 6.1, 6.4, 6.5, 6.8-9)
    a. Fundamental Objective: Maintain minimum instream flows for all stream reaches as defined in the Settlement Agreement.
    b. Means Objective: Restore, enhance, and maintain minimum instream flows for impacted stream reaches within the footprint of the hydropower project.
    c. Existing Situation:

i. Instream flow implementation increased minimum instream flow release in bypass reaches to improve water quality parameters and aquatic organism habitat.
ii. Installed telemetered gaging stations in all hydropower affected reaches.
iii. Lemolo 2 Reroute ramped flows down 1 mile of pipe from generator tailrace directly to Toketee Lake.
iv. Ramping rates set for area below Soda Dam.
v. No ramping allowed for areas above Soda Springs Reservoir, excepting during planned shutdowns.
vi. Emergency bypass valves installed to retain minimum instream flows.

16. **Riparian Habitat**
    a. Fundamental Objective: Maintain properly functioning riparian areas and floodplains
    b. Means Objective: maintain, restore and enhance properly functioning riparian areas and floodplains through regular flood inundation and rebuilding of floodplain sediment. Inundation and flood flows also effect the species diversity of riparian areas and ensure the riparian areas are resilient.
    c. Existing Situation:
        i. Permanently lost habitat due to physical improvements/infrastructure
        ii. Impacted habitat due to ramping or other activities - Restoration of riparian habitat along project affected reaches of White Mule and Potter Creeks.
        iii. Lack of regular flooding has reduced regeneration within riparian areas and a loss of sediment on floodplains resulting in reduced soil development and nutrient inputs. This results in a lack of floodplain connectivity and riparian function which will change these ecosystems and the function of the aquatic ecosystem slowly over time.